

CURRICULUM VITAE

RUNE BAKKE

(20. June 1958)

Telemark University College,
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UNIVERSITY DEGREES

Ph.D. Thesis: "Biofilm Detachment"

Montana State University, USA, 1986

M.Sc. Environmental Engineering

Montana State University, USA, 1983

B.Sc. Civil Engineering

Montana State University, USA, 1980

Teknisk/Naturvitenskaplig studieretning

Rogaland Distriktshøgskole (1977 - 78).

PROFESSIONAL EXPERIENCE

Professor, Environmental Engineering (1994 -), Telemark University College

Professor, Visiting (2006 -), Hubei University, Wuhan, China

Vice Dean, (2002-2003) Faculty of Technology

Institute Board (1996-2003) Institute of Environmental Engineering

Professor, Environmental Engineering (1993-94), University of Stavanger

Assistant Professor (1986-93), University of Stavanger

Institute vice-director (1992 - 94)

Research Assistant, NSF stipend (1981-1986), Montana State University

Research Consultant (1994 -), Tel-Tek; (1988-96), Rogaland Research Institute

PhD Opponent at NTNU, UMB, Chalmers and Lund University

Board of directors, Stavanger Botanical Garden (1987-1994)

Board of directors (2002-2008), Bio Tek AS (Ltd.), Porsgrunn, Norway

Board of directors (2002-), Waterment AS, Porsgrunn, Norway

Director (1996-97), Hifo Tech AS, Porsgrunn, Norway

Board of directors (1996-2002), Hifo Tech AS, Porsgrunn, Norway

Board of directors (Chairman)(1993-97), EnQua AS, Bryne, Norway

Program coordinator (2006-) Develop new M.Sc. in 'Sustainable Process Development' at University of Moratuwa, Sri Lanka

Secretary (1994-95) NSF; RUSH technology transfer program in Telemark

Program committee for "Technology for sustainable development in Sub-Saharan Africa"; International symposium, 1991; "Ullandhaugkonferansen", 1989 - 1990. Stavanger

NORAD, development aid consultant (1989 - 1992) Kenya

Reviewer for National Science Foundation (USA): Biological instrumentation program.

Reviewer for the Journals *Biotechnology & Bioengineering*, *Water Science and Technology* and *Water Research*

Advisory Board for the Bentham *The open Waste Management Journal*

IAWPRC Task Group on modeling of biofilm systems 1986.

Chairman (1979-1985) Association of Norwegian Stud. Abroad (ANSA) in Montana

Part time jobs (1973-1982); construction, forestry, aluminium industry, renovation

Patent, USA, Number 4,912,332

Environmental engineering consulting: Various water and wastewater treatment projects for city engineering departments, public and private enterprises. Main focus: Design and implementation of waste and wastewater treatment plants for resource recovery (biogas etc.) processes for domestic, industrial and agricultural wastes.

ENGINEERING PROJECTS

1996-present. Design and evaluation of anaerobic ("biogas") treatment processes; on behalf of Norsk Hydro ASA, Hifo-Tech AS, BioTek AS, public customers and the government for the treatment of domestic, industrial and agricultural wastes:

Design consultant for full scale and pilot plants to treat pig manure, cow manure, food industry wastes, and source separated food waste (full scale plants are at: Åna in Rogaland, Kongsberg in Buskerud, Jevnaker in Akershus and Treungen in Telemark, all in Norway).

Test methods to determine the biogas potential of various wastes are established in our laboratories and used by public and private clients.

1995-1996. Investigation of anaerobic processes in sewer lines (on behalf of Norsk Hydro ASA).

1994-2005. Redox oscillations as a bioreactor control method for nitrogen removal and energy savings in wastewater treatment plants (WWTP). (Implemented in 5 WWTP).

1993-present. Design of treatment plants for recreational homes (Commercial products sold by Waterment AS).

1994. "The Øksnevad concept". Design, construction and optimization of a "zero effluent" wastewater and sludge treatment plant. Full scale pilot in the national pollution authority (SFT) ecological engineering program.

1993. "Alginate industry wastewater treatment". Developing methods to recover fibers from wastewater. (Reports to the National Science Foundation).

1992. Wet-composting with nitrification. Consulting the development of a wet-composting organic sludge treatment system with nitrification for land application.

1992. "Figgjo a/s industry effluent treatment". Process design to recycle valuable particles and water back into production.

1992-1993. Design, construction and follow-up of advanced sewage treatment for a mountain touring resort (Haukelisæter Fjellstue).

1990-1994. Design and evaluation of 6 farm scale sewage treatment systems. SFT ecological engineering program.

1990. Test of New-Line Biorotor (RBC) for BOD removal and adaptation for nitrogen removal.

1989. Design and construction of pilot closed loop aquaculture systems for fresh water fish, with microbial and hydro pond treatment of re-circulating water.

1989-1998. Design, implementation and follow-up of full scale wetland treatment plants for urban and rural storm-water, Stavanger-Jæren (Water shed restoration projects).

1989. UV-sterilization of potable water at Omvikdalen Vassverk, design.

1988. Evaluation of wastewater treatment technology for the Stavanger sewage.

1988. Pilot studies to treat contaminated storm-water run-off to lakes in Stavanger.

PUBLICATIONS AND PRESENTATIONS

1. Bakke R., W.G. Characklis, and M.G. Trulear. 1981. A comparative evaluation of substrate utilization by attached and suspended biomass. A.I.Ch.E. annual meeting, symposium on fixed-film systems for industrial wastewater treatment, New Orleans, LA, USA.
2. Bakke R. 1982. Modelling of dispersed and immobilized microbial processes. Poster paper presented at the workshop on fouling of shipboard heat transfer surfaces, Office of Naval Research, power program, Bozeman, MT, USA.
3. Bakke R., M.G. Trulear, J.A. Robinson, and W.G. Characklis. 1984. Activity of *Pseudomonas aeruginosa* in biofilms: steady state. **Biotech. & Bioeng.** **26**:1418-1424.
4. Characklis W.G., R. Bakke, A. Escher, M.A. Siebel, and M.H. Turakhia. 1984. Fouling on the outside surface of a heated submarine pipeline and its effects on heat transfer resistance. Case study, Chevron Oil Co.
5. Characklis W.G., A.I. Yeh, and R. Bakke. 1985. Microbial fouling and its control: a phenomenological approach. In W. Chow and Y.G. Mussalli, eds., Proceedings: Condenser Biofouling Control; State-of-the-Art Symposium. Pp. 2.1-2.27. Electric Power Research Institute, Palo Alto, CA.
6. Characklis W.G., R. Bakke, and M.G. Trulear. 1986. Fundamental considerations of fixed film systems. Chapter 54:945-961 in **Comprehensive Biotechnology**, M. Moo-Young (ed.), Pergamon Press, Oxford, England.
7. Bakke R. and P.Q. Olsson. 1986. Biofilm thickness measurements by light microscopy. **Journal of Microbiological Methods**, **5**:93-98.
8. Bakke R. 1986. Biofilm Detachment. Ph.D. Dissertation. Montana State University, Montana.
9. Bakke R. 1987. Biofilm processes and mathematical modeling. Seminar on Biofilms and Biocorrosion. Norwegian Biochemical Society and Norsk Korrosjonsteknisk Forening. Trondheim. Invited lecture.
10. Lewandowski Z., R. Bakke, and W.G. Characklis. 1987. Nitrification and autotrophic denitrification in calcium alginate beads. **Wat. Sci. Tech.** **vol. 19**, pp 175-182.
11. Characklis W.G., R. Bakke, and M.H. Turakhia. 1988. Theoretical analysis of a *Pseudomonas aeruginosa* biofilm. Proceedings from the International Conference for Water and Wastewater Microbiology, Newport Beach, CA. **Wat. Sci. Tech.** **vol. 20**, no 11, pp 45-51.
12. Bakke R., K. Salte, and P. Ingsøy. 1989. Biological effects in porous media. Proceedings from the 5th European symposium on improved oil recovery, Budapest.
13. Bakke R. 1990. Boreslam/Borekaks fra petroleumsvirksomhet -Vannforurensing (Drilling mud/Cuttings from Offshore drilling - Water pollution). **Vann**, **1**:111-116.
14. Bakke R., K. Salte, H. Tengberg-Hansen and P. Ingsøy. 1990. Xanthan degradation by biofilm in porous media. **Biofouling** **2**:311-321.
15. Bakke R., W.G. Characklis, M.H. Turakhia and A.I. Yeh. 1990. Modeling a monopopulation biofilm system: *Pseudomonas aeruginosa*. Chapter 13 in **Biofilms**. W.G. Characklis and K.C. Marshall (eds.), John Wiley, New York, NY.
16. Christensen B.E., H. Naper Tønnes, K. Vollan, O. Smidsrød and R. Bakke. 1990. Biofilm removal by low concentrations of hydrogen peroxide. **Biofouling** **2**:165-175.
17. Bakke R., B. Rivedal and S. Mehan. 1992. Oil reservoir biofouling control. **Biofouling**, **6**, pp.53-60.
18. Seland A., T. Bilstad, S. Mehan and R. Bakke. 1992. Membrane filtration of sea water for oil reservoir injection. SPE annual meeting. Washington D.C.
19. Bakke R. 1993. The Frøyland Lake; presentation of a watershed restoration project. Presented at the 2nd "Environment Northern Seas" (ENS) conference. Stavanger.

20. Lauvik T. and R. Bakke. 1994. Biofilm thickness measurements by variance analysis of optical images. **J. of Microb. Meth.**, **20**, pp219-224.
21. Bakke R., E. Hagman, P.H. Ollestad & R. Kommedal 1995. Naturbaserte metoder for nitrogenfjerning (Natural treatment systems for nitrogen removal). **Vann**, **3**, pp425-437.
22. Hagman E., P.H. Ollestad and R. Bakke. 1996. Utforming, effekter og modellering av rensesplanter. **Vann**, **2**, 306-315.
23. Hagman E., Ollestad P.H., og Bakke R. 1997. Løsninger for rensing av avløp i spedt bebyggelse: Kostnadsanalyse. **Norsk Kommunletek.** 5.
24. Horntvedt, B., Rambekk, M., Bakke, R. 1997. Oscillating conditions to influence the compositions of mixed biological cultures, Proc 2. intl IAWQ conf on microorganisms in activated sludge and biofilm processes, Berkeley, California July 1997.
25. Paulsen J.E., E. Oppen and R. Bakke. 1996. Biofilm morphology in porous media, a study with microscopic and image techniques **Wat. Sci. Tech**, **36**, No 1, 1-9.
26. Bakke R., Rambekk M. & Horntvedt B. 1997. Styling og overvåking av biologiske rensesplanter. **Norsk Kommunletek.** **8**, 8-11.
27. Horntvedt, B., Rambekk, M., Bakke, R. 1998. Oscillating conditions to influence the compositions of mixed biological cultures, **Wat. Sci. Tech**, **37**, No 4-5, 259 - 262.
28. Kommedal R. Thorbjørnsen T., Bakke R. 1999. Hydrolysis of adsorbed particulate organic matter in aerobic biofilms. Oral pres. 4th. Int. IWA Conf. on Biofilm systems, New York.
29. Bakke R. 1999. Stoffbalanse og ressursbruk: Fosfor – fornybar ressurs? Presented at the seminar, Vann på tvers: Hva vil vi med våre vassdrag?, Stavanger.
30. Bakke R., Hagman E., Ollestad P.H., Sele K. 2000. Nutrient removal in combined bioreactors and wetland systems in Norway. **J. Env. Sci. & Health.** **34**, 10, pp75-82.
31. Ydstebø, L., Kommedal, R., Bakke R. 2000. Seasonal Variations in Nutrient Removal in Cold Climate Constructed Wetlands. 7th international conference on Wetland systems for water; Proceedings; pp. 129 - 134.
32. Bakke R., Kommedal R. and Kalvenes S. 2001. Quantification of biofilm accumulation by an optical approach. **J. Microb. Meth.**, **44**, pp13-26.
33. Villaverde S., Lacalle M.L., García P.A., Bakke R., and Fdez-Polanco F. 2001. Total nitrogen removal from UASB effluents highly loaded with nitrogen in a continuous activated sludge reactor operated with short cycle aeration. 9th World Congress on Anaerobic Digestion 2001. Antwerpen, Belgium.
34. Bakke R. and Hustvedt P.R. 2001. Arealavrenning og økologiske rensesplanter på Jæren. **Vann**, **4**, pp327-331.
35. Kommedal R., Bakke R., Dockery J. and Stoodley P. 2001. Modelling production of extracellular polymeric substances in a *Pseudomonas aeruginosa* chemostat culture. **Wat. Sci. Tech.**, **43**, 6, pp129-134.
36. Bakke R. 2003. Miljøvernministeren må feie for egen dør. Kronikk om miljøforvaltning i **Aftenposten** 11.8. pp 7.
37. Peiris B. R. H., Rathnasiri P.G., Johansen J.E., Kuhn A. and Bakke R. 2005. ADM1 Simulations of hydrogen production. Oral Pres. Proceedings, 4th Int. symp. on Anaerobic Digestion of Solid Waste, Copenhagen, Denmark.
38. Peiris B. R. H., Rathnasiri P.G., Johansen J.E., Kuhn A. and Bakke R. 2005. ADM1 with modifications for Bio-hydrogen Simulations. Oral Pres. Proceedings, 1st int. workshop on Anaerobic Digestion Model No. 1, Copenhagen, Denmark.
39. Rathnasiri P.G., Johansen J.E., Drangeid C.B. and Bakke R. 2005. Transient co-digestion plant behavior. Oral Pres. Proceedings, 4th Int. symp. on Anaerobic Digestion of Solid Waste, Copenhagen, Denmark.
40. Johansen J.E. and Bakke R. 2005. Enhancing hydrolysis with microaeration. Oral

- Pres. Proceedings, 4th Int. symp. on Anaerobic Digestion of Solid Waste, Copenhagen, Denmark.
41. Rathnasiri P.G., Dinamarca C. and Bakke R. 2005. Membrane controlled micro-aeration in digesters. Poster Presentation. Proceedings, 4th Int. symp. on Anaerobic Digestion of Solid Waste, Copenhagen, Denmark.
 42. Braskerud B.C., Tonderski K.S., Wedding B., Bakke R., Blankenberg A.-G.B., Ulén B., and Koskiaho J. 2005. Can constructed wetlands reduce the diffuse phosphorus loads to eutrophic water in cold temperate regions? **J. of Env. Quality** **34**:2145-2155.
 43. Kommedal R., Milferstedt K, Bakke R. and Morgenroth E. 2006. Effects of Initial molecular weight on removal rate of dextran in biofilms. **Wat. Res.** **40**: 1795-1804.
 44. Johansen J.-E. and Bakke R. 2006. Enhancing hydrolysis with microaeration. **Wat. Sci. Tech.** **53, No. 8**: 43-50.
 45. Peiris B. R. H., Rathnasiri P.G., Johansen J.E., Kuhn A. and Bakke R. 2006. ADM1 Simulations of hydrogen production. **Wat. Sci. Tech.** **53, No. 8**: 129-137.
 46. Rathnasiri P.G., Biogas processes to recover energy from wastes/wastewater. 6th EcoBaltica conf., St.Petersburg, Russia.
 47. Dinamarca C., Johansen J.E. and Bakke R. 2006. Challenges in fermentative hydrogen production. 6th EcoBaltica conf., St.Petersburg, Russia.
 48. Bakke R. and Hogland W. 2006. Environmental engineering and management education. 6th EcoBaltica conf., St.Petersburg, Russia.
 49. Zhao H., Johansen J.E., Kuhn A. and Bakke R. 2006. Biogas from fruit residues. 6th EcoBaltica conf., St.Petersburg, Russia.
 50. Chai Q., Bakke R. and Lie B. 2006. Object-oriented modeling and optimal control of a biological wastewater treatment process. Proceedings. Oral Pres. 8th IAESTED Control and Application conf., Montreal, Canada.
 51. Chai Q., Bakke R. and Lie B. 2006. Optimal control of a biological wastewater treatment process with intermittent aeration. Proceedings. Oral Pres. SIMS Simulation and Modeling 2006 conf., Helsinki, Finland.
 52. Greer T., Li Y., Song Y., Wu W., Botheju D. and Bakke R. 2007. Full scale process design for energy recovery from apple waste at a juice factory. Proceedings. Oral Pres. Eco-Tech 2007 conf., Kalmar, Sweden.
 53. Song Y., Greer T., Li Y., Wu W., Botheju D. and Bakke R. 2007. Biogas potential from apple waste. Oral Pres. Proceedings. Oral Pres. Eco-Tech 2007 conf., Kalmar, Sweden.
 54. Stjernholm H., Dinamarca C., Botheju D. and Bakke R. 2007. Liquid extraction of substrate from manure for efficient biogas generation. Proceedings. Oral Pres. Eco-Tech 2007 conf., Kalmar, Sweden.
 55. Botheju D., Svalheim Ø., Rydtun B., Johansen J-E. and Bakke R. 2007. Nutrient recovery from anaerobically digested organic wastes. Proceedings. Oral Pres. Eco-Tech 2007 conf., Kalmar, Sweden.
 56. Botheju D., Svalheim Ø., Rydtun B., Johansen J-E. and Bakke R. 2007. Potential of fertilizer production by nitrification of anaerobic digester effluents. Proceedings. Oral Pres. 12th European biosolids and organic resources conference, Manchester, UK.
 57. A simple two-stage anaerobic digestion process consisting of a leach-bed and a biogas reactor used for treating agriculture organic waste. 2007. Zhiqiang C., Bakke R., Dinamarca C. and Wenjun W. Oral Pres. 3. Int. Green Energy Conf., Västerås, Sweden.
 58. Botheju D., Rathnasiri P.G. and Bakke R. 2008. Biofilms on oxygen transfer membranes in membrane micro-aerated anaerobic digesters. Proceedings. Oral Pres. 8th. Int. IWA Conf. on Biofilm Technologies. Singapore.

59. Dinamarca C. and Bakke R. 2008. Hydrogen Consumption in Bio-hydrogen process modeling. Proceedings. Oral Pres. SIMS Simulation and Modeling 2008 conf., Oslo, Norway.
60. Botheju D., Bakke R. and Lie B. 2008. Implementation of ADM1 model in Aquasim biofilm reactor compartment. Proceedings. Oral Pres. 49th SIMS Conf. on Simulation and Modeling 2008 conf., Oslo, Norway.
61. Dinamarca C. and Bakke R. 2009. Apparent hydrogen consumption in acid reactors: Observations and implications. **Wat. Sci. Tech.** **59**, **No. 7**: 1441-1447.
62. Rathnasiri P.G., Botheju D. and Bakke R. 2009. Effects of Biofilm Formation on Oxygen Transfer Membranes in Membrane Micro-Aerated Anaerobic Digesters. Poster presentation. Final MBR Workshop, Berlin.
63. Sustainable Urban Wastewater Treatment in China. 2009. Bakke R., Bo X., and Xi-quan H. Proceedings (Invited Oral Pres.) "The International Workshop on Strategy for Anaerobic Biotechnology-Anaerobic Technology from the West to the East of the Earth", Xi'an, China: 239-243.
64. Botheju, D., Lie, B., Bakke R. 2009. Modeling free oxygen effects in anaerobic digestion. Proceedings. MATHMOD 2009 - 6th Vienna International Conference on Mathematical Modeling.
65. Botheju D., Li Y., Hovland J., Risberg T., Haugen H.A., Dinamarca C. and Bakke R. 2009. Oxygenated anaerobic treatment of amine wastes generated in post-combustion CO₂ capture. Proceedings. 5th Trondheim Conference on CO₂ Capture, Transport and Storage. Trondheim, Norway.
66. Chang L., Bo X., and Bakke R. 2009. Biogas from pig manure leachate. Proceedings (Oral Pres.) "The International Workshop on Strategy for Anaerobic Biotechnology-", Xi'an, China: 122-128.
67. Bo X., Chang L. and Bakke R. 2009. Sustainability of small-scale biogas plants. Proceedings (Oral Pres.) "The International Workshop on Strategy for Anaerobic Biotechnology-", Xi'an, China:175-182.
68. Deshai B., Lie B. and Bakke R. 2009. Effects of Oxygen in Biogasification; Evaluation of ADM1-ox model against experimental data. Oral Pres., Proceedings of the SIMS 50 – Modelling and simulation of Energy Technology – 50th Conference on Simulation and Modelling, Fredericia, Denmark.
69. Deshai B., Li Y., Hovland J., Risberg T., Haugen H.A., Dinamarca C., Bakke R. 2010. Effects of Oxygen in Biogasification; Evaluation of ADM1-ox model against experimental data. Oral Pres., Treatment of Amine Wastes Generated in Post-combustion CO₂ Capture; Oxygenated Anaerobic Approach. Oral pres., Proceeding & accepted for journal publication, Doha, Qatar.